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Effects of hydrogen sulfide on the exo- and endocytosis of synaptic vesicles in frog motor nerve endings

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Abstract

Using electrophysiological and optical methods, we studied the effects of sodium hydrosulfide (NaHS), a hydrogen sulfide donor, on the dynamics of transmitter release and exo- and endocytosis of synaptic vesicles in motor nerve endings during long-term high-frequency stimulation (20 Hz) in experiments with the cutaneous pectoris frog muscle. H2S increased the amplitude of endplate currents under conditions of a single stimulation of the motor nerve and slowed down the depression of the end plate currents during high-frequency stimulation (20 Hz, 3 min). Using the endocytic fluorescent dye FM 1-43, we showed that NaHS increased the dye uptake during high-frequency stimulation as compared to the control. However, after termination of the high-frequency stimulation the fluorescence intensity of nerve terminals was lower in the presence of NaHS than in the control experiments. In addition, NaHS slowed the dye release from the nerve terminals that were loaded during 20 Hz stimulation. The results thus obtained indicate that H2S accelerates the synaptic vesicles cycle in frog motor nerve ending by enhancement of exocytosis and fast endocytosis of synaptic vesicles during high-frequency stimulation.

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Keywords

end-plate currents, endo- and exocytosis, FM 1-43, hydrogen sulfide, motor nerve ending, synaptic vesicles, transmitter release